Inclusive Photoproduction of Light Mesons $\rho^0(770)$, $f_0(980)$, $f_2(1270)$,$K^{0*}(892)$, $\varphi(1020)$ at HERA and Exclusive Dijet in DPE at LHC

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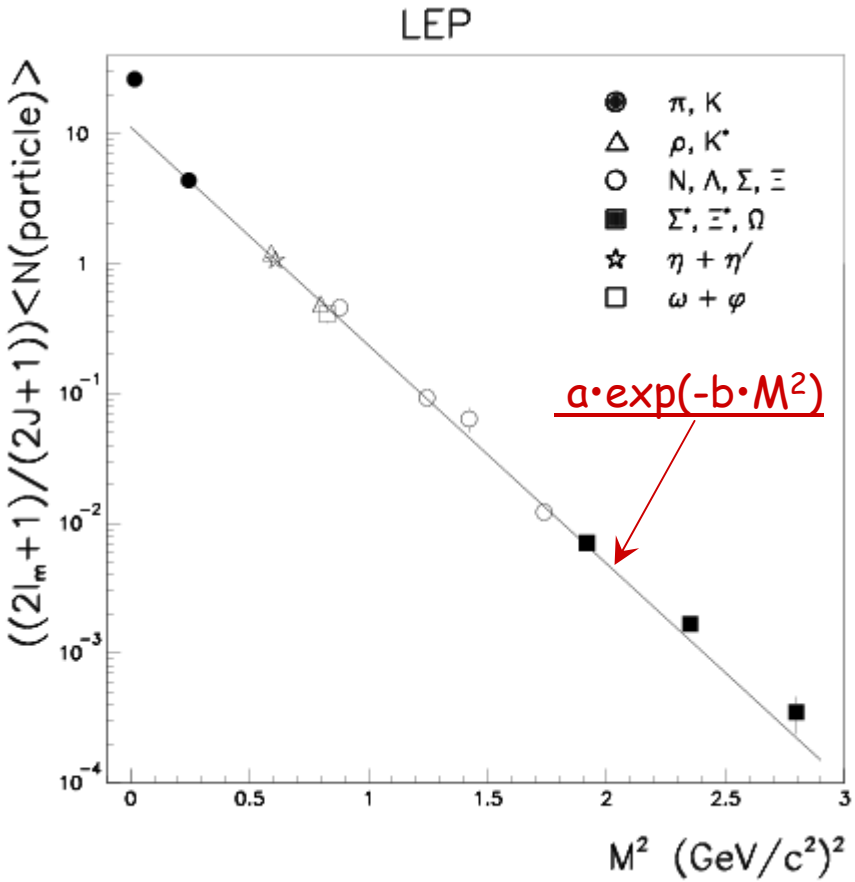
- Inclusive photoproduction of light mesons at HERA:
  - Motivation
  - Some results
  - Plans
- Exclusive Dijet in DPE at LHC
  - Motivation
  - Plans

Motivation



The meson and baryon production rates at Z^0 pole at LEP lie on the one universal curve.
The same effect observed at PETRA and PEP.

Motivation

Total $\gamma^* + p \rightarrow V + p$ cross section as function of Q^2

The cross sections were scaled by factors, according to the quark charge content of the vector meson

$$\rho : \omega : \varphi : J/\Psi = 1 : 9 : 9/2 : 9/8$$

Approximated with

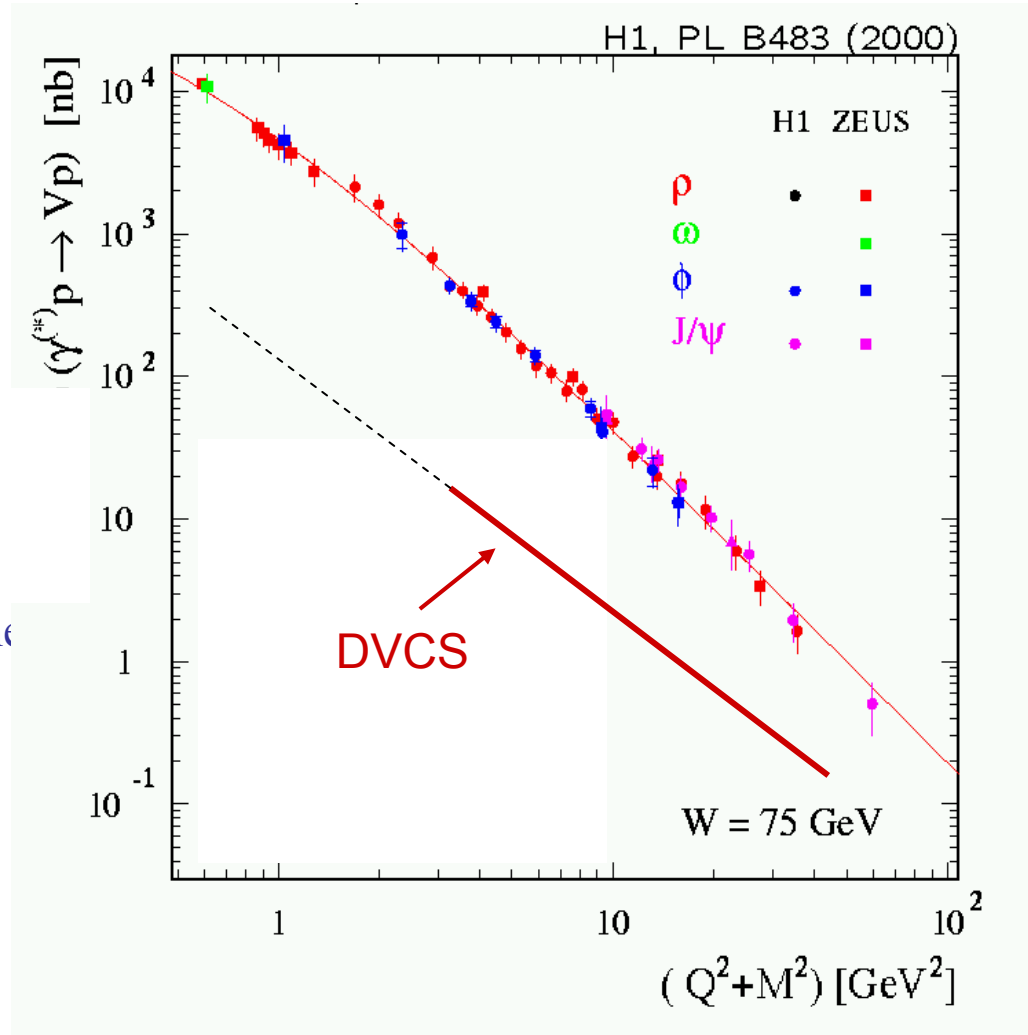
$$\sigma(Q^2) \propto 1/(Q^2 + M^2)^n$$

DVCS : n ≈ 1.5

VM : n ≈ 2.5 extra $(Q^2+M^2)^{-1}$ from the Vm wave function

Details:

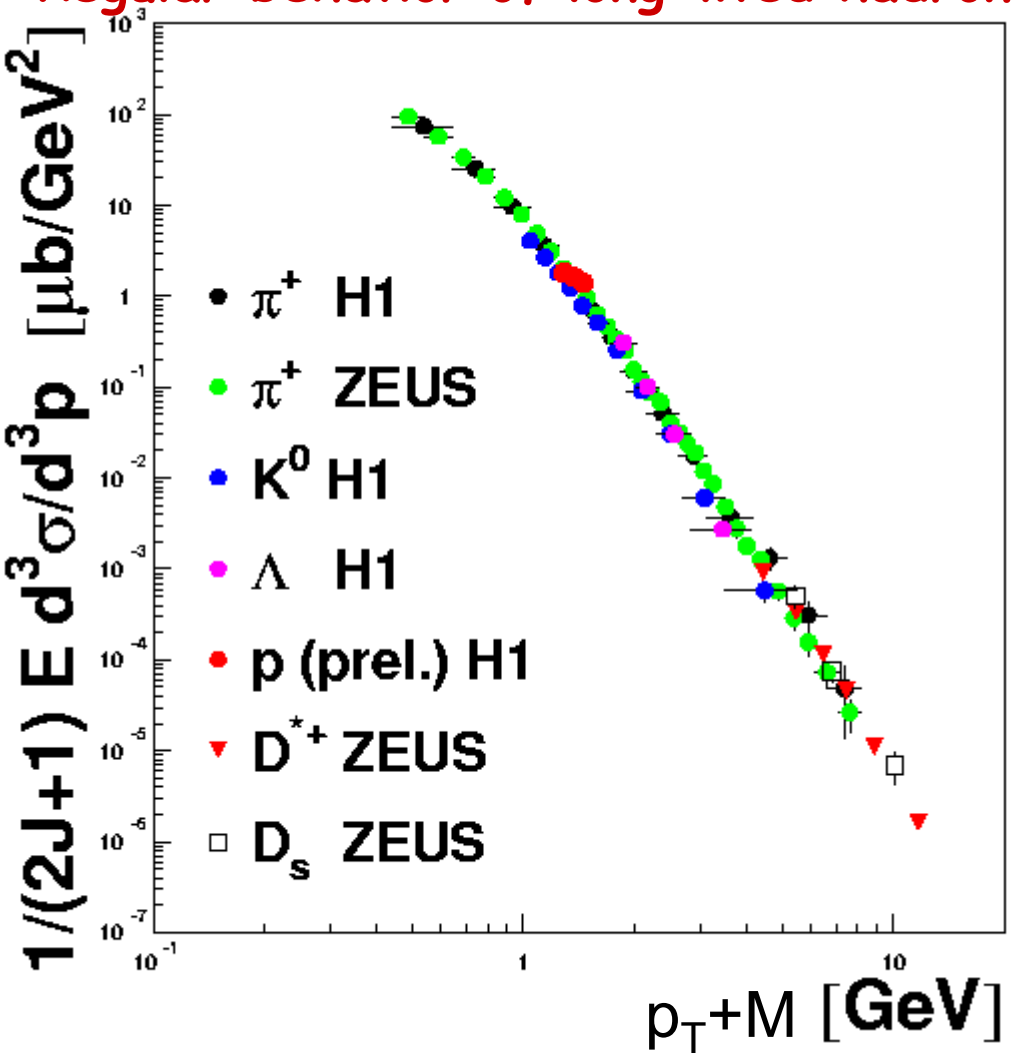
Fit to whole Q^2 range gives bad χ^2/dof



striking universality in vector meson production

Motivation

Regular behavior of long-lived hadrons



striking universality for long-lived hadrons production

Motivation

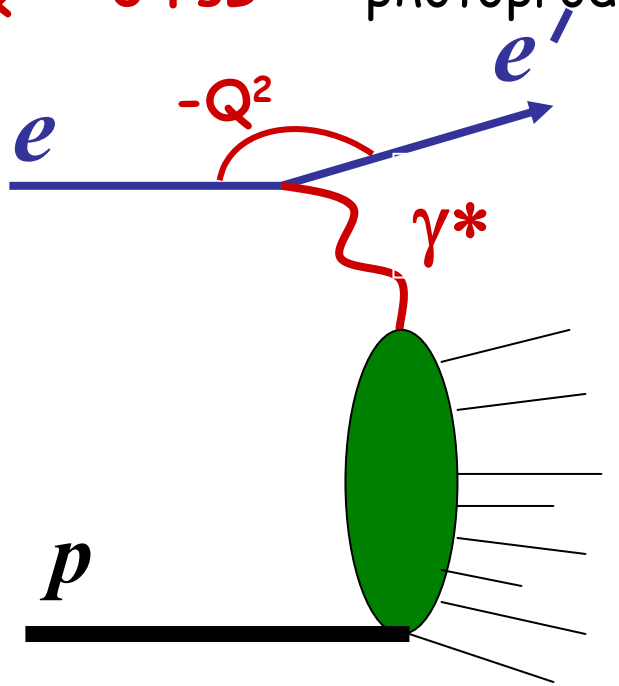
Particle production measurements at high energy

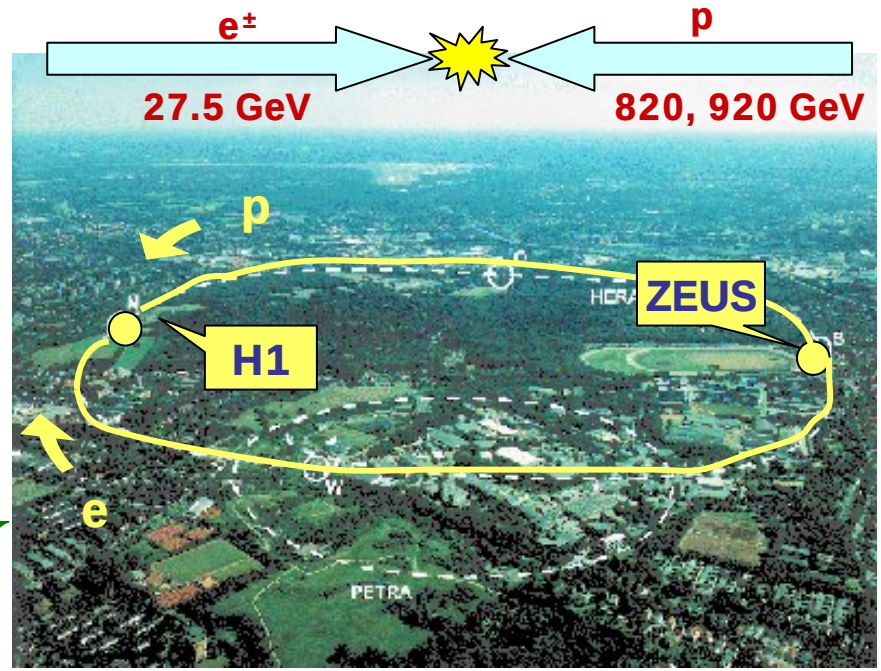
Particle	LEP $\sqrt{S} = M_{Z_0}$	HERA $\sqrt{S} = 200 GeV$	CERN $\sqrt{S} = \frac{540}{630} GeV$	Tevatron $\sqrt{S} = 1800 GeV$
Charged	+	+	+	+
K^0_s	+	+	+	+
Λ	+	+	+	?
p	+	+	?	?
D/D_s	+	+	?	?
D^*	+	+	?	+
B	+	?	?	+
ρ^0, $K^{*0}(892)$, $\varphi(1020)$	+	?	?	?
ϕ	+	?	?	+
η	+	?	+	?
many more	+	?	?	?

ρ^0, $K^{*0}(892)$, $\varphi(1020)$ measurements at HERA help to study hadronization

Data Selection

$Q^2 \approx 0$ ГэВ^2 — photoproduction





$\gamma + p \longrightarrow h + X$

$h = \rho^0, K^{*0}(892)$ or $\varphi(1020)$

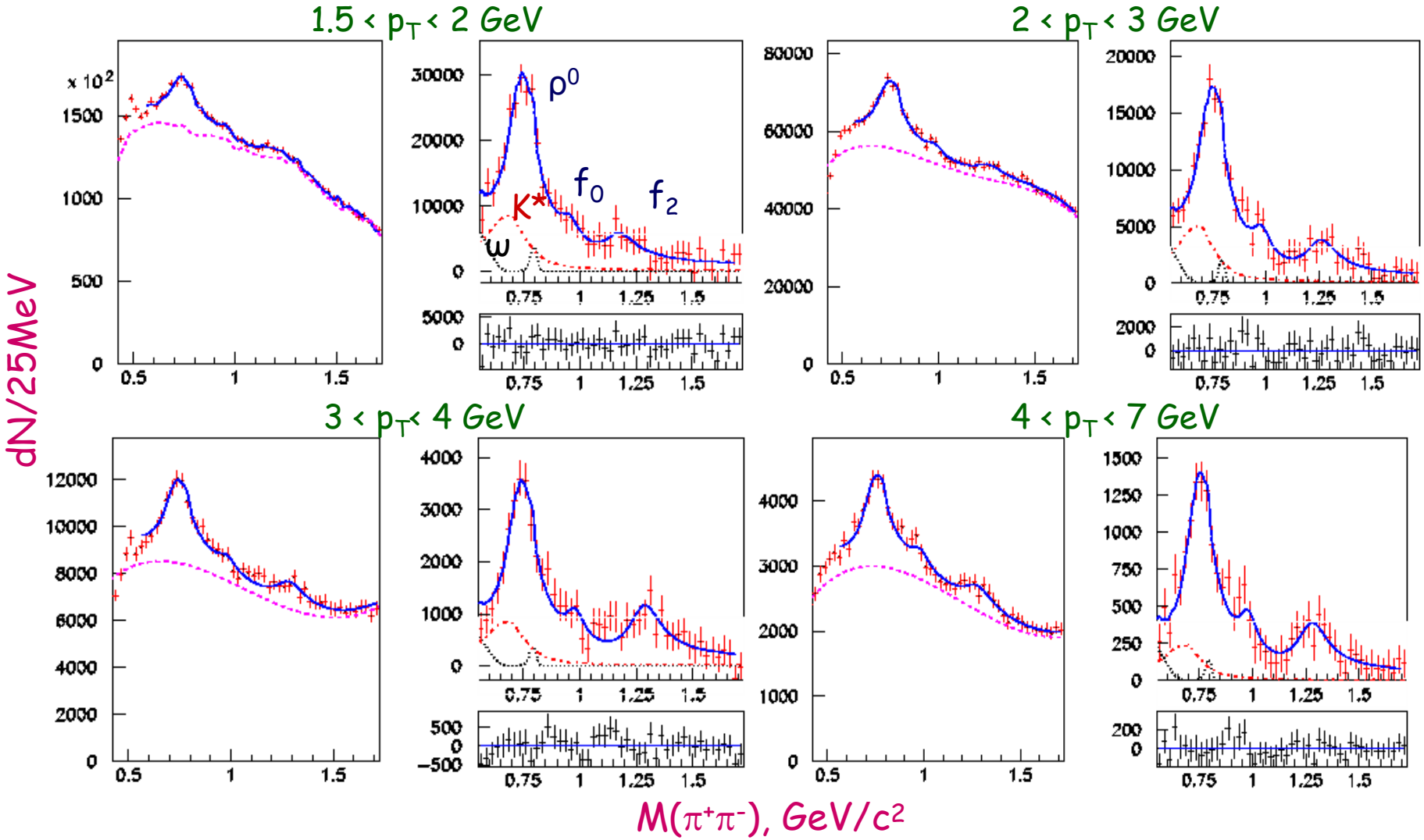
$\rho^0 \longrightarrow \pi^+\pi^-$

$K^{*0}(892) \longrightarrow K\pi$

$\varphi(1020) \longrightarrow K^+K^-$

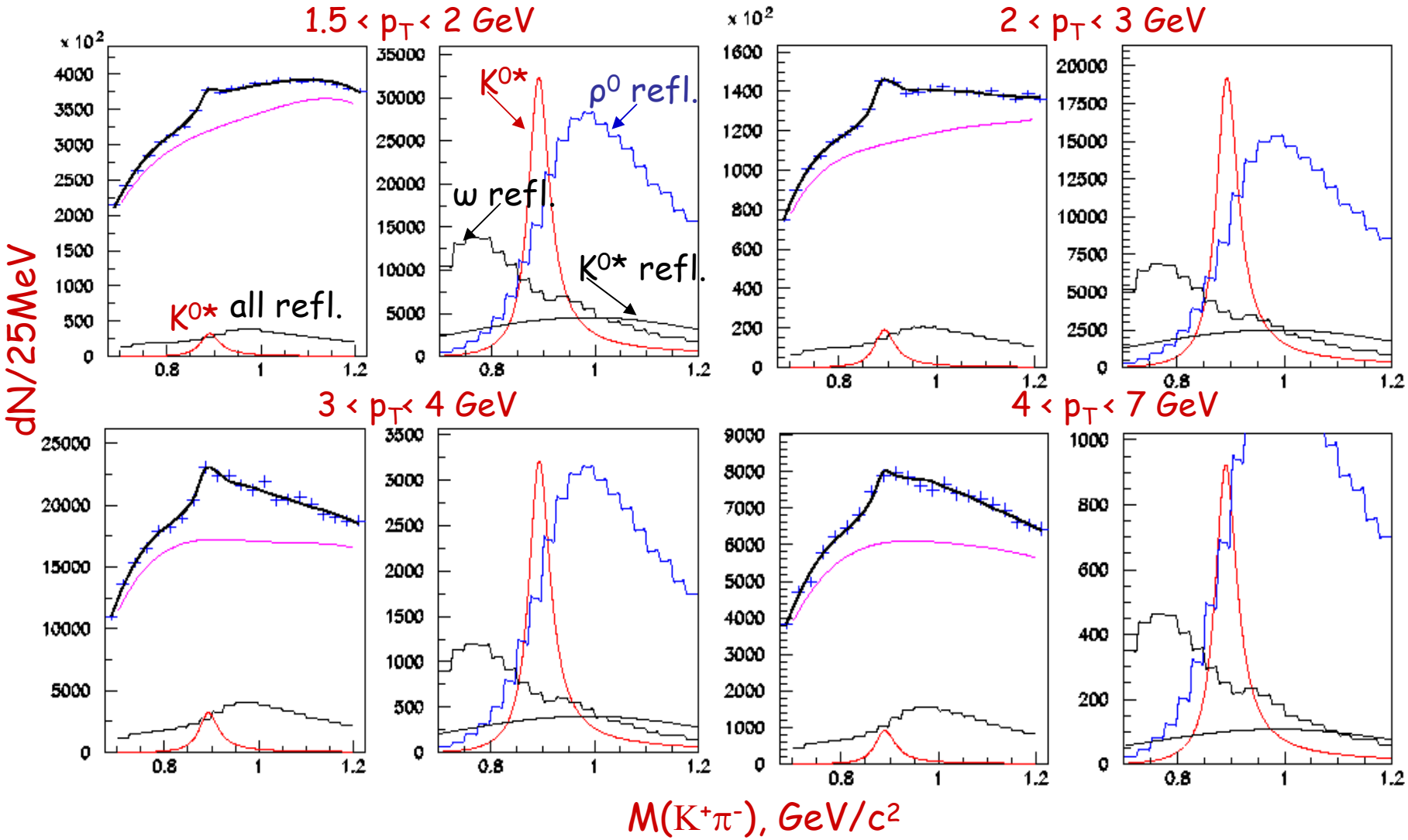
2000 year DATA is analyzed

$\rho^0(770)$, $f_0(980)$ and $f_2(1270)$ observation



Due to small signal and nontrivial Back Ground behavior
it is not possible to make correct measurements for **$f_0(980)$ and $f_2(1270)$** x-section

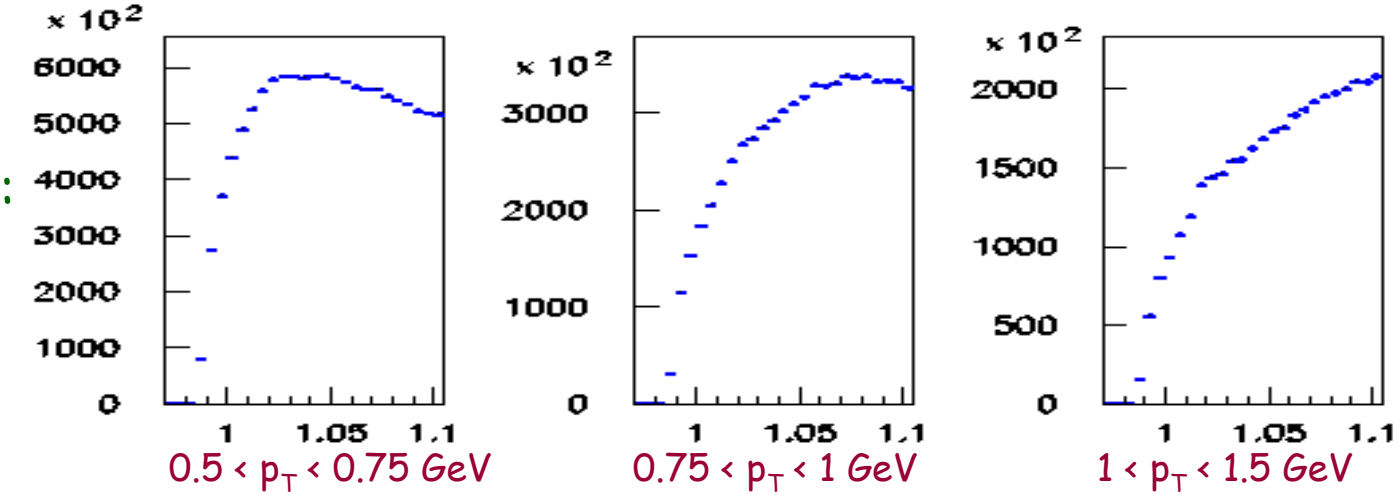
$K^{0*}(892)$ observation



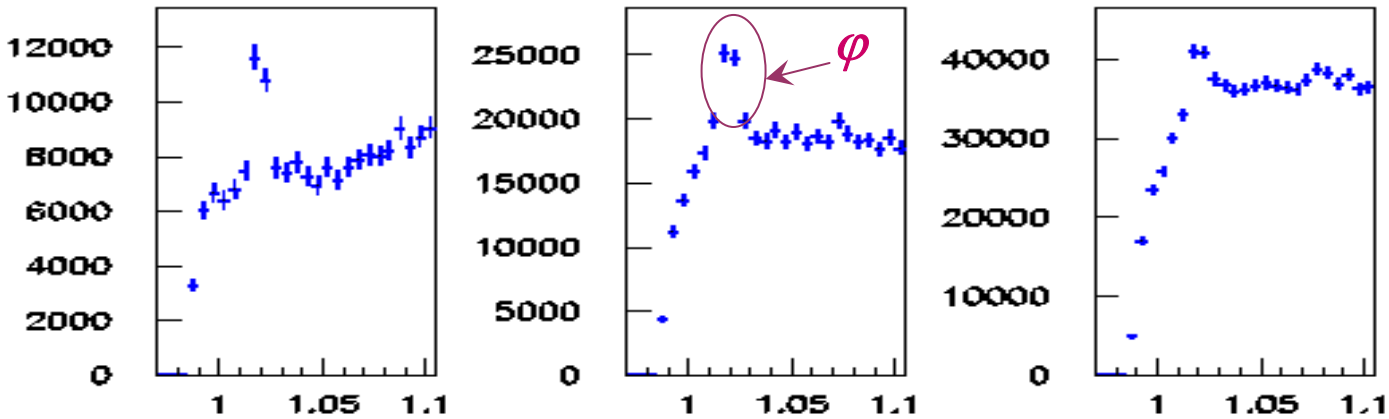
Significant signal of K^{0*} is observed

dE/dx in M(KK)

M(KK) without dE/dx:



M(KK) with dE/dx for Kaons, LN_{Kaon} > 0.1 :



$LN_{Kaon} = LH_{Kaon}/\{LH_{Proton} + LH_{Kion} + LH_{Pion} + ...\}$ — normalized likelihoods

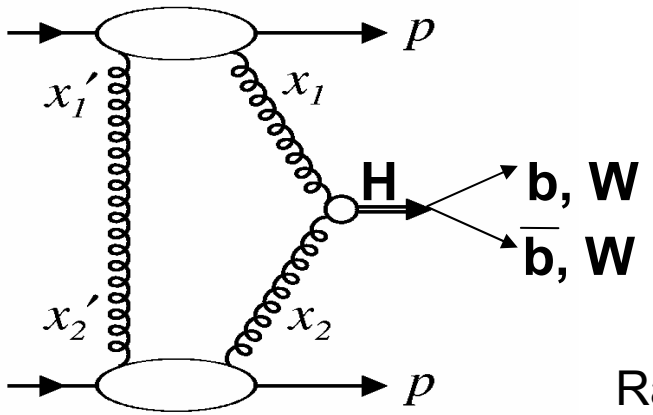
dE/dx increase signal of φ(1020) meson for low 0.5 < p_T < 1.5 GeV

Plans on 2008

- to calculate inclusive differential x-sections for ρ^0, K^{0*} and φ in $p_T > 0.5$ GeV with all systematic
- to analyzed x-section of mesons (compare with other data)
- to make a paper

Motivation

Exclusive Higgs boson production at LHC

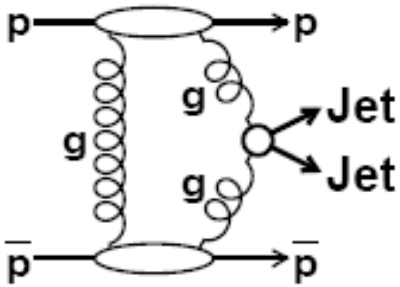


- *missing mass method*
  - ⊆ *high mass resolution (2÷4 Gev)*
- *suppression of $b\bar{b}$-pair production*
  - ⊆ *high Signal/BG ratio*

Rapidity gap suppression ⟹ Low cross section

How large is the rapidity gap suppression?

This is tested at LHC:

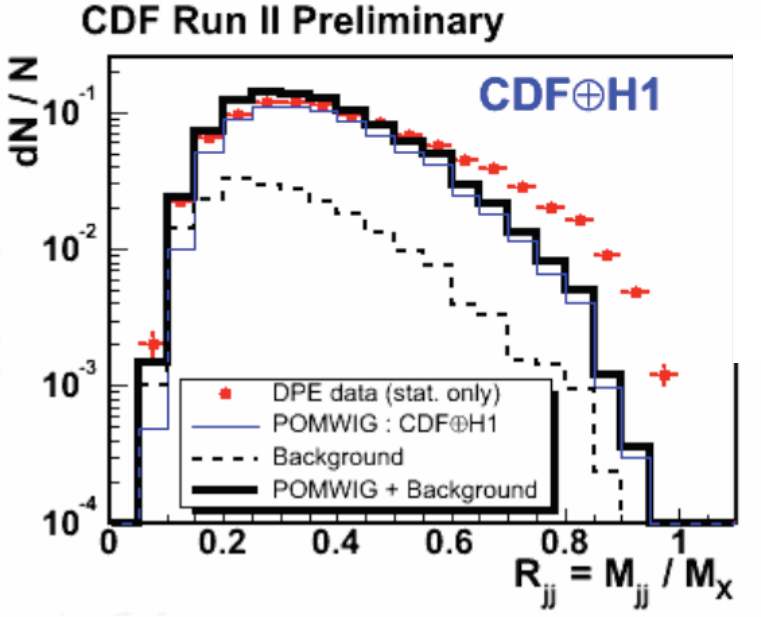


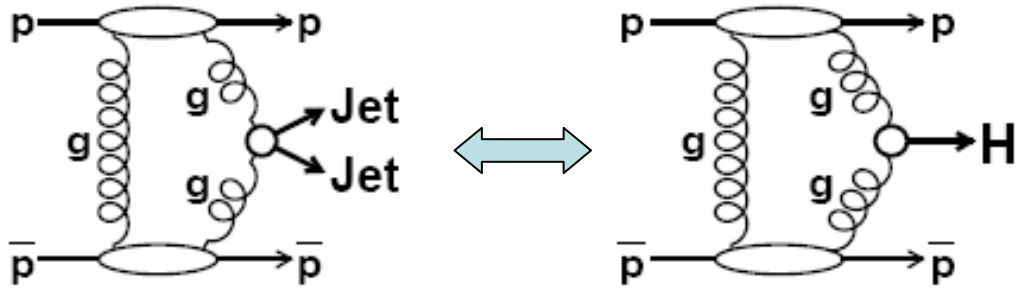
•exclusive ***dijet*** production ($p + p \rightarrow p +$ *jet-jet* $+ p$)

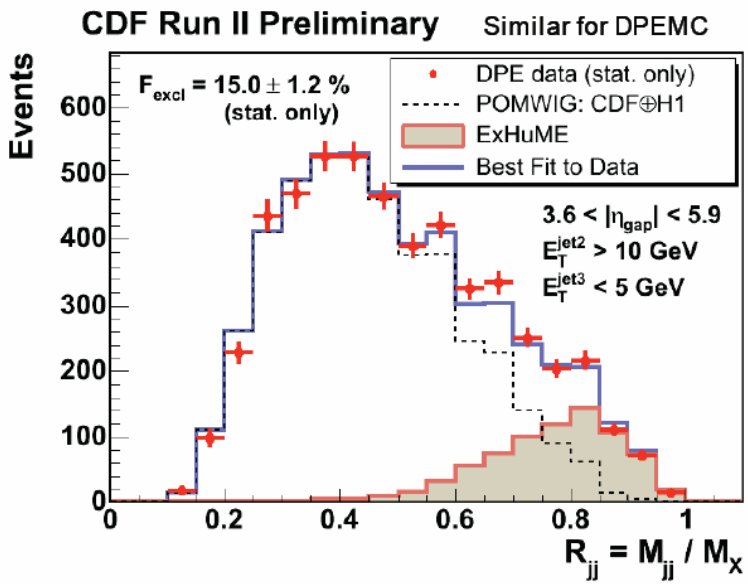
Measurement of exclusive dijet production at LHC help to predict exclusive x-section for Higgs

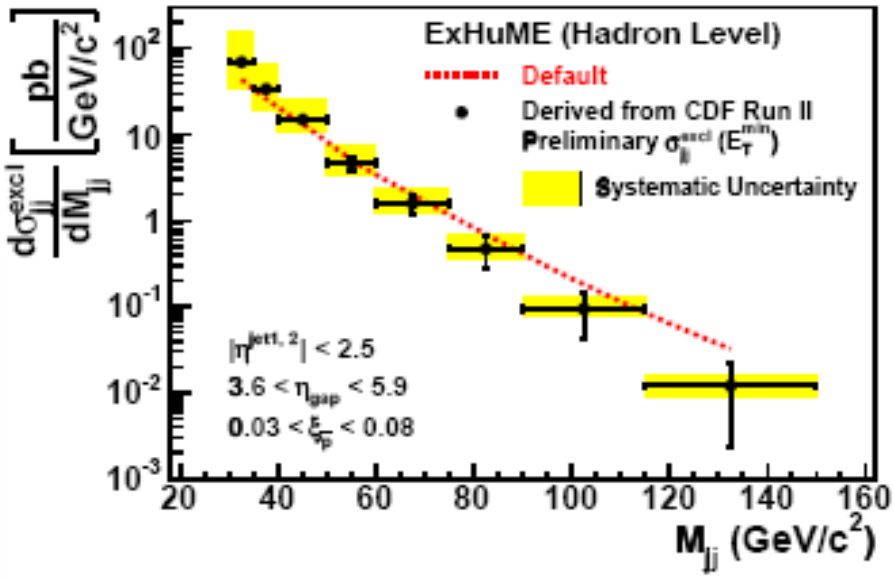
Motivation

Central exclusive dijet production at CDF









Measurement of exclusive dijet production at LHC is obligatory for exclusive Higgs production estimate at LHC

Plans on 2008

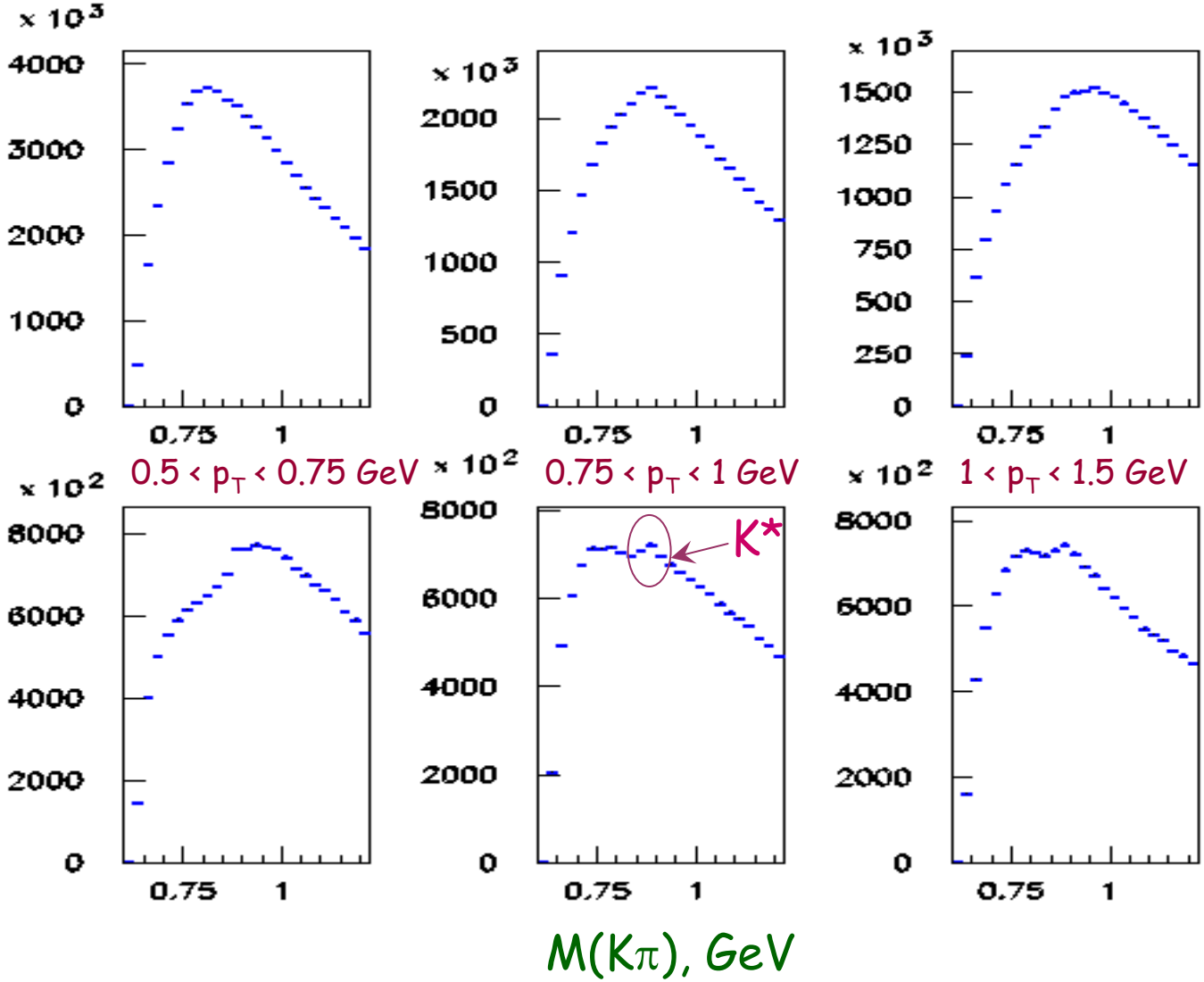
- study trigger and efficiency of reconstruction for exclusive jets

- development of analysis tool
  (we are at very beginning of this work)

Backup slides

dE/dx in M(Kπ)

M(Kπ) without dE/dx:



M(Kπ) with dE/dx for Kaons, $LN_{Kaon} > 0.1$:

dE/dx increase signal of $K^{*0}(892)$ meson for low $0.5 < p_T < 1.5$ GeV

High p_T region (p_T > 1.5 GeV/c) and fit

High p_T ⇒ low multiplicity with high p_T

Bose-Einstein-Correlation effects are not taken into account

$M(\pi^+\pi^-)$ or $M(K\pi)$ is fitted by Function(m)=BG(m)+Signal(m)+Reflections(m)

BG(m) = {$M(\pi\pm\pi\pm)$ or $M(K\pm\pi\pm)$)}*Pol(2-3)

Signal(m): Original shape of mesons is relativistic Breit-Wigner:

$$BW(m)=Amm_0\Gamma(m)/[(m^2-m_0^2)^2+m_0^2\Gamma^2(m)]$$

$$\Gamma(m)=\Gamma_0(q/q_0)^{2l+1}m_0/m$$

q – is a momentum of the decay products in the rest frame of the parent, q_0 – is the momentum when $m=m_0$

l=0, 1, 1, 1, 2 for ρ_0, φ, K^{0*}, f_0, f_2 correspondingly

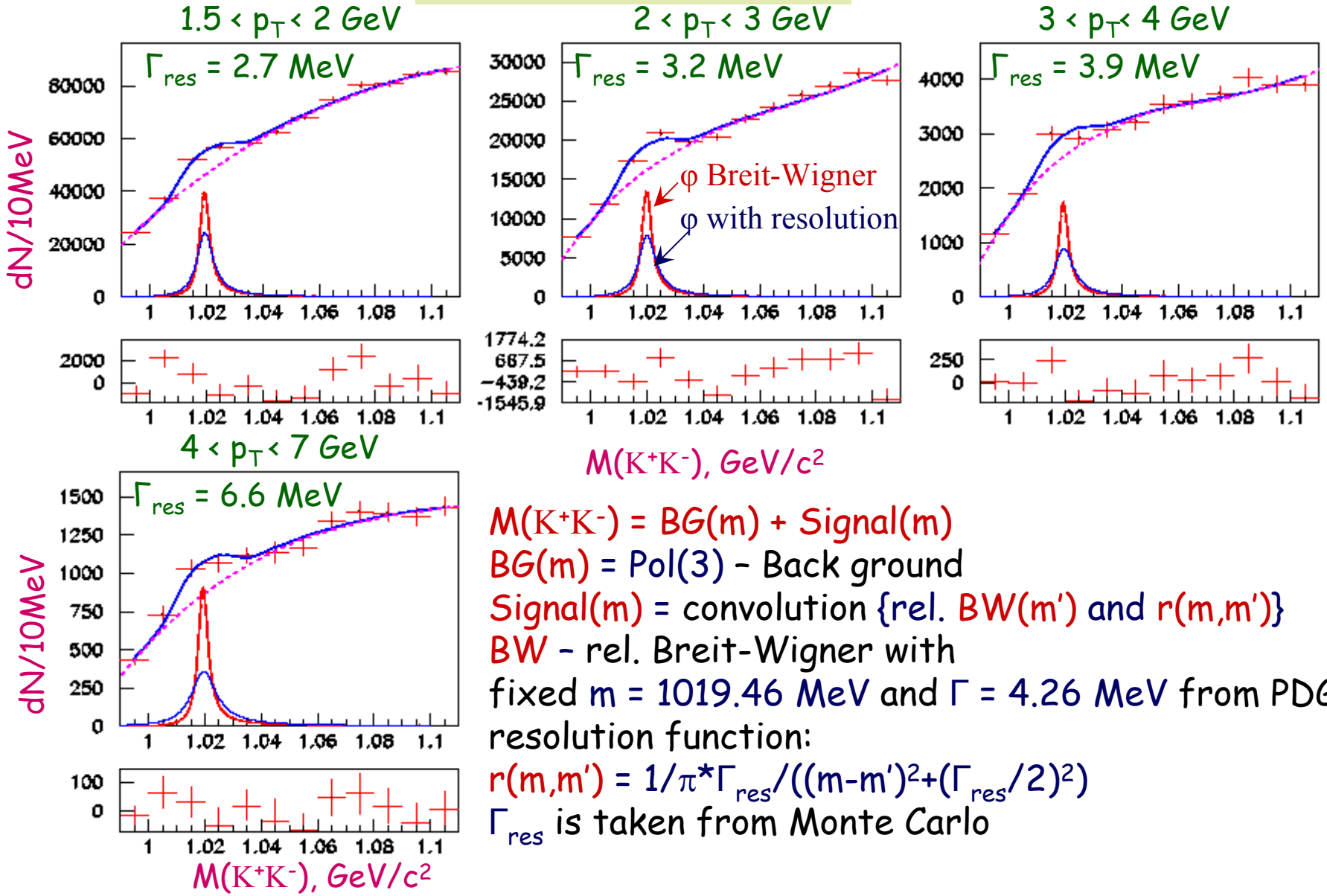
Reflection's shapes are taken from PYTHIA 6.2

$M(\pi+\pi-)$: from $\omega\rightarrow\pi^+\pi^-(\pi^0)$ and $K^{*0}(892)\rightarrow\pi K$

$M(K\pi)$: from $\omega\rightarrow\pi^+\pi^-(\pi^0)$, $\rho\rightarrow\pi^+\pi^-$ and $K^{*0}(892)\rightarrow\pi K$ (wrong K)

Number of particles is defined 2.5 width Γ_0 of mesons

φ(1020) observation



M(K⁺K⁻) = BG(m) + Signal(m)

BG(m) = Pol(3) – Back ground

Signal(m) = convolution {rel. BW(m') and r(m,m')}

BW – rel. Breit-Wigner with

fixed m = 1019.46 MeV and Γ = 4.26 MeV from PDG

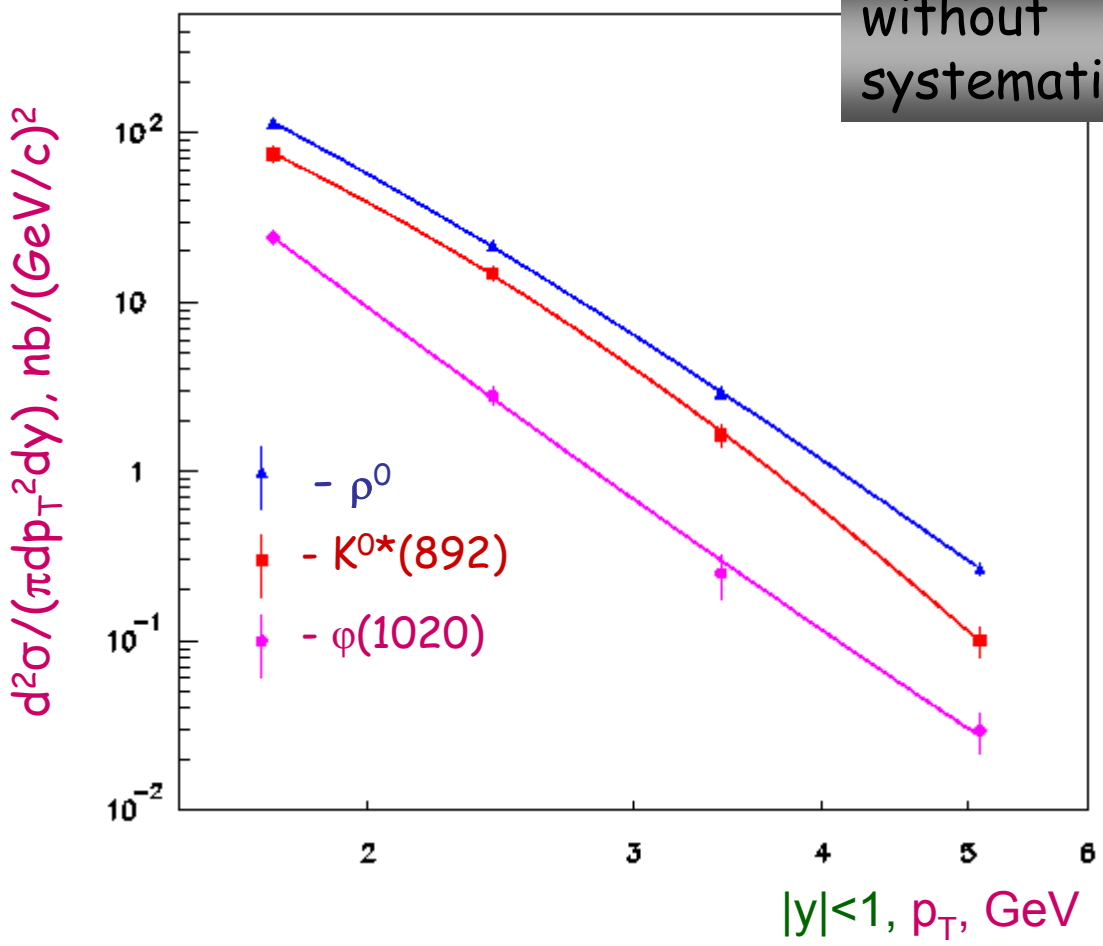
resolution function:

$r(m,m') = 1/\pi * \Gamma_{res}/((m-m')^2+(\Gamma_{res}/2)^2)$

Γ_{res} is taken from Monte Carlo

Cross section

without systematic errors



Cross section of the mesons is calculated